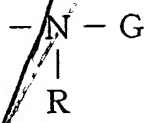
CLAIMS

1. A chelate-forming filter comprising, at least as a portion of a filter material, a chelate-forming fiber having a chelate-forming functional group introduced into a fiber molecule.

2. A chelate-forming filter according to claim 1, wherein said chelate-forming functional group is a group represented by the following general formula (1) and having an amino group and at least two hydroxyl groups combined with carbon:



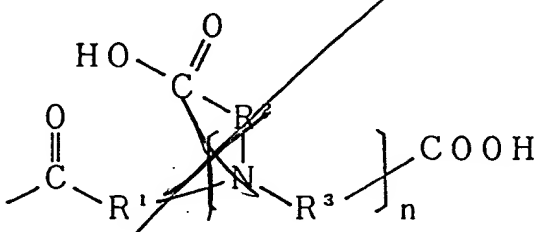
..... (1)

[wherein, G represents a residue of a chain sugar alcohol or a residue of a polyhydric alcohol, and R represents a hydrogen atom, a (lower) alkyl group, or -G (wherein G has the same meaning as defined above and may be identical to or different from the aforementioned G)].

3. A chelate-forming filter according to ~~claim 2~~ claim 1, wherein G is a residue in which an amino group is eliminated from D-glucamine, and R is a hydrogen atom or a lower alkyl group, in the general formula (1).

4. A chelate-forming filter according to ~~claim 2~~ claim 1, wherein G is a dihydroxypropyl group, and R is a hydrogen or a lower alkyl group, in the general formula (1).

5. A chelate-forming filter according to claim 1, wherein said chelate-forming functional group is an acyl group represented by the following general formula (3):



…… (3)

(wherein each of R^1, R^2, and R^3 represents a lower alkylene group; and n denotes an integer of 1 to 4).

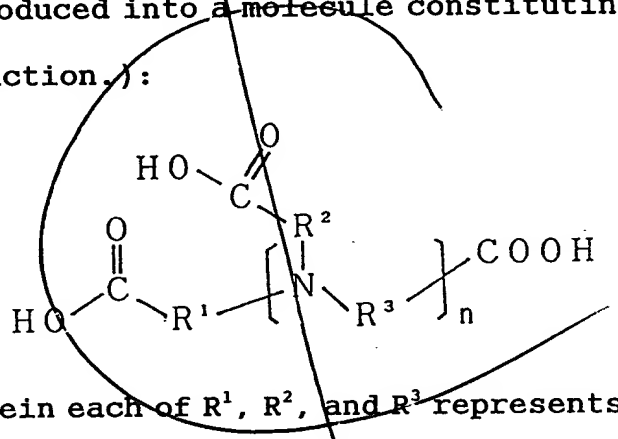
6. A chelate-forming filter according to ~~one of claims 1 to 5~~ claim 1, wherein said chelate-forming functional group is directly introduced into a reactive functional group in a fiber molecule, or is introduced via another reactive functional group into a molecule constituting the fiber.

7. A chelate-forming filter according to ~~one of claims 2 to 4 and 6~~ claim 1, wherein said chelate-forming fiber is obtained by allowing an amine compound represented by the following general formula (2) and having an amino group and at least two hydroxyl groups combined with carbon, to react directly with a reactive functional group in a molecule constituting the fiber, or to react with another reactive functional group, said another reactive functional group being introduced into a molecule constituting the fiber prior to the reaction.

…… (2)

[wherein G and R have the same meanings as defined above]

8. A chelate-forming filter according to ~~one of claims 5 and 6~~, wherein said chelate-forming fiber is obtained by allowing an acid anhydride of a polycarboxylic acid represented by the following general formula (4) to react directly with a reactive functional group in a molecule constituting the fiber, or to react with another reactive functional group, said another reactive functional group being introduced into a ~~molecule~~ constituting the fiber prior to the reaction.):



…… (4)

(wherein each of R^1, R^2, and R^3 represents a lower alkylene group, and n denotes an integer of 1 to 4).

9. A chelate-forming filter according to claim 8, wherein said acid anhydride of polycarboxylic acid represented by the general formula (4) is at least one selected from the group consisting of nitrilotriacetic anhydride, ethylenediaminetetraacetic dianhydride, and diethylenetriaminepentaacetic dianhydride.

10. A chelate-forming filter according to ~~one of claims 1 to 9~~, which has an introduced amount of the chelate-forming functional group calculated by the following equation of equal

to or more than 10% by weight.

Introduced amount (% by weight) =

[(weight of fiber after reaction - weight of fiber before reaction)/(weight of fiber before reaction)] x 100

11. A chelate-forming filter according to one of claims 1 to 10, wherein said fiber is at least one selected from the group consisting of natural fibers, regenerated fibers, and synthetic fibers.

12. A chelate-forming filter according to ~~one of claims 1 to 4, 6, 7, 10, and 11~~ claim 1, wherein said chelate-forming fiber has a capability of capturing, as a chelate, a metalloid element or a compound thereof.

13. A chelate-forming filter according to claim 12, wherein said metalloid element or a compound thereof is boron or a boron compound.

14. A chelate-forming filter according to ~~one of claims 1, 5, 6, 8 to 11~~ claim 1, wherein said chelate-forming fiber has a capability of capturing, as a chelate, a heavy metal element or a compound thereof.

15. A process for the purification of a liquid, comprising the step of allowing a liquid to pass through a device to which the chelate-forming filter of ~~one of claims 1 to 14~~ claim 1 is mounted to concurrently remove ionic substances and insoluble impurities in the liquid.

16. A process for the purification of a liquid according

to claim 15, wherein said liquid is an aqueous liquid or an oily liquid.

17. A process for producing a chelate-forming filter, comprising the steps of processing a fiber into a filter, said fiber having, in a molecule, a functional group being reactive with a chelate-forming compound, and allowing the reactive functional group in said fiber molecule to react with a chelate-forming compound having a functional group being reactive with said functional group to thereby introduce a chelate-forming functional group into said fiber molecule.

18. A process for producing a chelate-forming filter according to claim 17, wherein said fiber molecule is allowed to react with the chelate-forming compound via a cross-linking agent.

19. A process for producing a chelate-forming filter according to claim 17 or 18, wherein an amine compound represented by the following general formula (2) is used as the chelate-forming compound:

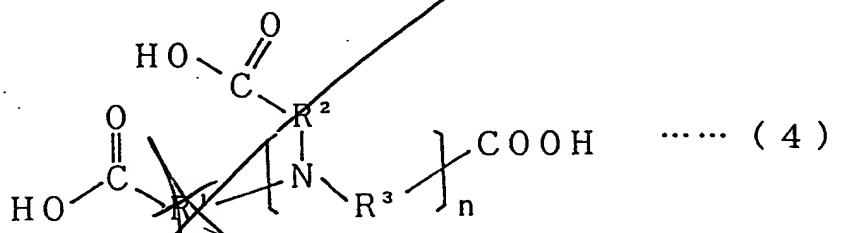
$$\cdots\cdots (2)$$

[wherein G and R have the same meanings as defined above].

20. A process for producing a chelate-forming filter according to claim 19, wherein said amine compound represented by the general formula (2) is at least one selected from the group consisting of D-glucamine, N-methyl-D-glucamine, and

dihydroxypropylamine.

21. A process for producing a chelate-forming filter according to claim 17 or 18, wherein an acid anhydride of a polycarboxylic acid represented by the following general formula (4) is used as the chelate-forming compound:



(4)

(wherein each of R^1, R^2, and R^3 is a lower alkylene group, and n denotes an integer of 1 to 4).

22. A process for producing a chelate-forming filter according to ~~claim 21~~ claim 17, wherein said acid anhydride of polycarboxylic acid represented by the general formula (4) is at least one selected from the group consisting of nitrilotriacetic anhydride, ethylenediaminetetraacetic dianhydride, and diethylenetriaminepentaacetic dianhydride.

23. A process for producing a chelate-forming filter according to claim 17, wherein a fiber having, in a molecule, a functional group being reactive with an acid anhydride is used; said fiber molecule is allowed to react with, as a cross-linking agent, an acid anhydride having a reactive double bond and is then allowed to react with the chelate-forming compound.

24. A process for producing a chelate-forming filter

according to claim 23, wherein a compound having, in a molecule, a carboxyl group and at least one group selected from the group consisting of amino group, imino group, and thiol group is used as the chelate-forming compound.

~~according to claim 23, wherein a compound having, in a molecule, a carboxyl group, and at least one group selected from the group consisting of imino group, and thiol group is used~~.

25. A process for producing a chelate-forming filter according to claim 24, ~~wherein at least~~ one selected from the group consisting of amino acids, iminodiacetic acid, iminodisuccinic acid, ethylenediaminediacetic acid, ethylenediaminetriacetic acid, ethylenediaminedisuccinic acid, thioglycolic acid, thiomalic acid, thiosalicylic acid, and mercaptopropionic acid is used as ~~the~~ compound having, in a molecule, a carboxyl group and at least one group selected from the group consisting of amino group, imino group, and thiol group.

26. A process for producing a chelate-forming filter according to claim 17, ~~one of claims 17 to 25~~, wherein an introduced amount of the chelate-forming functional group calculated by the following equation is set at equal to or more than 10% by weight.

Introduced amount (% by weight) =
[(weight of fiber after reaction - weight of fiber before reaction)/weight of fiber before reaction] x 100

27. A process for producing a chelate-forming filter according to one of claims 17 to 26, wherein at least one selected from the group consisting of natural fibers, regenerated fibers, and synthetic fibers is used as the fiber.